HEWLETT-PACKARD COMPANY
Intellectual Property Administration
P.O. Box 272400
Fort Collins, Colorado 80527-2400

PATENT APPLICATION

ATTORNEY DOCKET NO. 200316547-1

IN THE
UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s): Randy L. Hoffman et al.

Confirmation No.: 1458

Application No.: 10/799,961

Examiner: KRAIG, William F.

Filing Date: March 12, 2004

Group Art Unit: 2892

Title: Semiconductor Device with Multiple Component Oxide Channel

Mail Stop Appeal Brief-Patents
Commissioner For Patents
PO Box 1450
Alexandria, VA 22313-1450

TRANSMITTAL OF APPEAL BRIEF

Transmitted herewith is the Appeal Brief in this application with respect to the Notice of Appeal filed on June 4, 2008.

☒ The fee for filing this Appeal Brief is $510.00 (37 CFR 41.20).

☐ No Additional Fee Required.

(complete (a) or (b) as applicable)

The proceedings herein are for a patent application and the provisions of 37 CFR 1.136(a) apply.

☐ (a) Applicant petitions for an extension of time under 37 CFR 1.136 (fees: 37 CFR 1.17(a)-(d)) for the total number of months checked below:

☐ 1st Month $120	☐ 2nd Month $460	☐ 3rd Month $1050	☐ 4th Month $1640

☐ The extension fee has already been filed in this application.

☒ (b) Applicant believes that no extension of time is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

Please charge to Deposit Account 08-2025 the sum of $ 510 . At any time during the pendency of this application, please charge any fees required or credit any over payment to Deposit Account 08-2025 pursuant to 37 CFR 1.25. Additionally please charge any fees to Deposit Account 08-2025 under 37 CFR 1.16 through 1.21 inclusive, and any other sections in Title 37 of the Code of Federal Regulations that may regulate fees.

☒ A duplicate copy of this transmittal letter is enclosed.

☐ I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, Alexandria, VA 22313-1450
Date of Deposit:

OR

☒ I hereby certify that this paper is being transmitted to the Patent and Trademark Office facsimile number (571)273-8300.
Date of facsimile: August 1, 2008
Typed Name: Rebecca R. Schew
Signature:

Respectfully submitted,
Randy L. Hoffman et al.
By

Steven L. Nichols
Attorney/Agent for Applicant(s)
Reg No.: 40,326
Date: August 1, 2008
Telephone: 801-572-8066

Rev 10/07(ApBrief)

DUPLICATE

HEWLETT-PACKARD COMPANY
Intellectual Property Administration
P.O. Box 272400
Fort Collins, Colorado 80527-2400

PATENT APPLICATION

ATTORNEY DOCKET NO. 200316547-1

IN THE
UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s): Randy L. Hoffman et al.

Confirmation No.: 1458

Application No.: 10/799,961

Examiner: KRAIG, William F.

Filing Date: March 12, 2004

Group Art Unit: 2892

Title: Semiconductor Device with Multiple Component Oxide Channel

Mail Stop Appeal Brief-Patents
Commissioner For Patents
PO Box 1450
Alexandria, VA 22313-1450

TRANSMITTAL OF APPEAL BRIEF

Transmitted herewith is the Appeal Brief in this application with respect to the Notice of Appeal filed on June 4, 2008.

☒ The fee for filing this Appeal Brief is $510.00 (37 CFR 41.20).

☐ No Additional Fee Required.

(complete (a) or (b) as applicable)

The proceedings herein are for a patent application and the provisions of 37 CFR 1.136(a) apply.

☐ (a) Applicant petitions for an extension of time under 37 CFR 1.136 (fees: 37 CFR 1.17(a)-(d)) for the total number of months checked below:

☐ 1st Month $120	☐ 2nd Month $460	☐ 3rd Month $1050	☐ 4th Month $1640

☐ The extension fee has already been filed in this application.

☒ (b) Applicant believes that no extension of time is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

Please charge to Deposit Account 08-2025 the sum of $ 510 . At any time during the pendency of this application, please charge any fees required or credit any over payment to Deposit Account 08-2025 pursuant to 37 CFR 1.25. Additionally please charge any fees to Deposit Account 08-2025 under 37 CFR 1.16 through 1.21 inclusive, and any other sections in Title 37 of the Code of Federal Regulations that may regulate fees.

☒ A duplicate copy of this transmittal letter is enclosed.

☐ I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, Alexandria, VA 22313-1450

Date of Deposit:

OR

☒ I hereby certify that this paper is being transmitted to the Patent and Trademark Office facsimile number (571)273-8300.

Date of facsimile: August 1, 2008

Typed Name: Rebecca R. Schow

Signature:

Respectfully submitted,

Randy L. Hoffman et al.

By

Steven L. Nichols

Attorney/Agent for Applicant(s)

Reg No. : 40,326

Date : August 1, 2008

Telephone : 801-572-8066

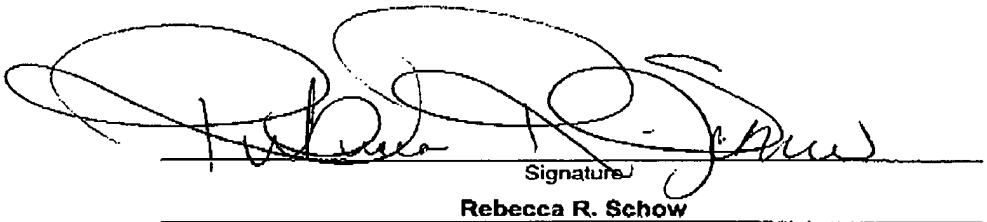
Rev 10/07(ApBrief)

Application No.: 10/799,961 Attorney Docket No.: 200316547-1

Certificate of Transmission

I hereby certify that this correspondence is being facsimile transmitted to the Commissioner for Patents via the USPTO central facsimile number, (571) 273-8300.

on **August 1, 2008**
Date



Signature

Rebecca R. Schow
Typed or printed name of person signing Certificate

Transmitted, herewith, are the following documents:

1. Transmittal of Appeal Brief with Duplicate Copy (2 pages)
2. Certificate of Transmission (1 page)
3. Appeal Brief (31 pages)

200316547-1

10/799,961

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the Patent Application of:

Randy L. Hoffman et al.

Application No.: 10/799,961

Filed: March 12, 2004

For: Semiconductor Device with Multiple Component Oxide Channel (as amended)

Group Art Unit: 2892

Examiner: KRAIG, William F.

Confirmation No.: 1458

APPEAL BRIEF

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This is an Appeal Brief under Rule 41.37 appealing the decision of the Primary Examiner dated 11 April 2008 (the "final Office Action"). Each of the topics required by Rule 41.37 is presented herewith and is labeled appropriately.

08/04/2008 VBUI11 00000018 082025 10799961
01 FC:1402 510.00 DA

I. Real Party in Interest

The real party in interest is Hewlett-Packard Development Company, LP, a limited partnership established under the laws of the State of Texas and having a principal place of business at 20555 S.H. 249 Houston, TX 77070, U.S.A. (hereinafter "HPDC"). HPDC is a Texas limited partnership and is a wholly-owned affiliate of Hewlett-Packard Company, a Delaware Corporation, headquartered in Palo Alto, CA. The general or managing partner of HPDC is HPQ Holdings, LLC.

II. Related Appeals and Interferences

There are no appeals or interferences related to the present application of which the Appellant is aware.

III. Status of Claims

Claims 3-5, 19 and 57 were cancelled previously without prejudice or disclaimer.

Under the imposition of a previous Restriction Requirement, claims 21-36 and 45-47 were withdrawn from consideration and cancelled without prejudice or disclaimer.

Thus, claims 1, 2, 6-18, 20, 37-44 and 48-56 are currently pending in the application and stand finally rejected. Accordingly, Appellant appeals from the final rejection of claims 1, 2, 6-18, 20, 37-44 and 48-56, which claims are presented in the Appendix.

IV. Status of Amendments

No amendments have been filed subsequent to the final Office Action of 11 April 2008, from which Appellant takes this appeal.

V. Summary of Claimed Subject Matter

Appellant's independent claims recite the following subject matter.

Claim 1 recites:

A semiconductor device, comprising:

a drain electrode (212) (*Appellant's specification, paragraph 0014*);

a source electrode (210) (*Appellant's specification, paragraph 0014*);

a channel (208) contacting the drain electrode (212) and the source electrode (210) (*Appellant's specification, paragraph 0014*), wherein the channel includes one or more compounds of the formula $A_xB_xO_x$ (*Appellant's specification, paragraph 0022*), wherein the one or more compounds of the formula $A_xB_xO_x$ includes one or more of gallium-germanium oxide, gallium-tin oxide, gallium-lead oxide, indium-germanium oxide, indium-lead oxide (*Appellant's specification, paragraph 0023*), each O is atomic oxygen , where each x is a non-zero number, but the value of "x" for each constituent element may be different (*Appellant's specification, abstract*), wherein the channel includes one of an amorphous form and a mixed-phase crystalline form (*Appellant's specification, paragraph 0028*); and

a gate dielectric (206) positioned between a gate electrode (204) and the channel (208) (*Appellant's specification, paragraph 0014*).

Claim 18 recites:

A semiconductor device, comprising:

a drain electrode (212) (*Appellant's specification, paragraph 0014*);

a source electrode (210) (*Appellant's specification, paragraph 0014*);

means for controlling current flow (208) electrically coupled to the drain electrode (212) and the source electrode (210) (*Appellant's specification, paragraph 0014*), wherein the means for controlling current flow (208) includes one or more compounds of the formula $A_xB_xO_x$ (*Appellant's specification, paragraph 0022*), wherein the one or more compounds of the formula $A_xB_xO_x$ includes one or more of gallium-germanium oxide, gallium-tin oxide, gallium-lead oxide, indium-germanium oxide, indium-lead oxide (*Appellant's specification, paragraph 0023*), where each x is a non-zero number, but the value of "x" for each constituent element may be different (*Appellant's specification, abstract*), wherein the channel (208) includes one of an amorphous form and a mixed-phase crystalline form (*Appellant's specification, paragraph 0028*); and

a gate electrode (204) separated from a channel (208) by a gate dielectric (206) (*Appellant's specification, paragraph 0014*).

Claim 37 recites:

A semiconductor device formed by the steps, comprising:

providing (310) a drain electrode (212) (*Appellant's specification, paragraph 0014*);

providing (310) a source electrode (210) (*Appellant's specification, paragraph 0014*);

providing a precursor composition (*Appellant's specification, paragraph 0040*) including one or more precursor compounds that include A_x and one or more compounds that include B_x (*Appellant's specification, paragraph 0040*), wherein the one or more compounds of the formula $A_xB_xO_x$ includes one or more of gallium-germanium oxide, gallium-tin oxide, gallium-lead oxide, indium-germanium oxide, indium-lead oxide (*Appellant's specification, paragraph 0023*), where each x is a non-zero number, but the value of "x" for each constituent element may be different (*Appellant's specification abstract*), wherein the channel

includes one of an amorphous form and a mixed-phase crystalline form (*Appellant's specification, paragraph 0028*);

depositing (320) a channel (208) including the precursor composition to form a multicomponent oxide from the precursor composition to electrically couple the drain electrode (212) and the source electrode (210) (*Appellant's specification, paragraph 0042*);

providing (330) a gate electrode (204) (*Appellant's specification, paragraph 0061*); and

providing (330) a gate dielectric (206) positioned between the gate electrode (204) and the channel (208) (*Appellant's specification, paragraph 0061*).

Claim 48 recites:

A display device, comprising:

a plurality of pixel devices (440) configured to operate collectively to display images (*Appellant's specification, paragraph 0062*), where each of the pixel devices includes a semiconductor device configured to control light emitted by the pixel device (*Appellant's specification, paragraph 0062*), the semiconductor device including:

a drain electrode (212) (*Appellant's specification, paragraph 0014*);

a source electrode (210) (*Appellant's specification, paragraph 0014*);

a channel (208) contacting the drain electrode (212) and the source electrode (210) (*Appellant's specification, paragraph 0014*), wherein the channel (208) includes one or more compounds of the formula $A_xB_xO_x$ (*Appellant's specification, paragraph 0022*), wherein the one or more compounds of the formula $A_xB_xO_x$ includes one or more of gallium-germanium oxide, gallium-tin oxide, gallium-lead oxide, indium-germanium oxide, indium-lead oxide (*Appellant's specification, paragraph 0023*),

each O is atomic oxygen, where each x is a non-zero number, but the value of "x" for each constituent element may be different (*Appellant's specification, abstract*), wherein the channel (208) includes one of an amorphous form and a mixed-phase crystalline form (*Appellant's specification, paragraph 0028*);

a gate electrode (204) (*Appellant's specification, paragraph 0014*); and

a gate dielectric (206) positioned between the gate electrode (204) and the channel (208) and configured to permit application of an electric field to the channel (208) (*Appellant's specification, paragraph 0014*).

VI. Grounds of Rejection to be Reviewed on Appeal

The final Office Action raised the following grounds of rejection.

(1) Claims 1, 2, 6-9, 18, 20, 37, 38 and 42-44 were rejected under 35 U.S.C. § 103(a) over the combined teachings of Hamada et al (JP Patent No. 405251705A) ("Hamada"), Phillips et al. ("Transparent Conducting Thin Films of $GaInO_3$," Appl. Phys. Let. Vol. 65 (1), July 1994) ("Phillips") and Narushima et al. ("Electronic structure and transport properties in the transparent amorphous oxide semiconductor 2 CdOGeO", Phys Rev. B 66, 035203-1, 7/16/2002) ("Narushima").

(2) Claims 10-13 and 39 were rejected as being unpatentable under 35 U.S.C. § 103(a) over the combined teachings of Hamada, Phillips, Narushima and Minami (of record).

(3) Claims 14-17 and 40-41 were rejected as being unpatentable under 35 U.S.C. § 103(a) over the combined teachings of Hamada, Phillips, Narushima, Minami (of record) and "D" ('Transparent Conducting PbO_2 films prepared by activated reactive evaporation," Phys. Rev. B 33, 2660-2664 (1986) ("D").

(4) Claims 48-52 were rejected as being unpatentable under 35 U.S.C. § 103(a) over the combined teachings of U.S. Patent No. 6,476,788 to Akimoto ("Akimoto"), Hamada, Phillips and Narushima.

(5) Claims 53 and 54 were rejected as being unpatentable under 35 U.S.C. § 103(a) over the combined teachings of Akimoto, Hamada, Phillips, Narushima and Minami (of record).

(6) Claims 55 and 56 were rejected as being unpatentable under 35 U.S.C. § 103(a) over the combined teachings of Akimoto, Hamada, Phillips, Narushima, Minami and D.

According, Appellant hereby requests review of each of these grounds of rejection in the present appeal.

VII. Argument

(1) Claims 1, 2, 6-9, 18, 20, 37, 38 and 42-44:

Claim 1:

Claim 1 recites:

> A semiconductor device, comprising:
> a drain electrode;
> a source electrode;
> *a channel contacting the drain electrode and the source electrode, wherein the channel includes one or more compounds of the formula $A_xB_xO_x$, wherein the one or more compounds of the formula $A_xB_xO_x$ includes one or more of gallium-germanium oxide, gallium-tin oxide, gallium-lead oxide, indium-germanium oxide, indium-lead oxide, each O is atomic oxygen, where each x is a non-zero number, but the value of "x" for each constituent element may be different*, wherein the channel includes one of an amorphous form and a mixed-phase crystalline form; and
> a gate dielectric positioned between a gate electrode and the channel.

(Emphasis added).

In contrast, the Office Action concedes that "Hamada et al., however, fails to disclose that compounds include gallium-tin oxide or that the compounds forming the channel region include one of an amorphous form and a mixed-phase crystalline form or that each x in the formula $A_xB_xO_x$ is independently a non-zero number." (Action, p. 3). Consequently, the Action cites to Phillips as teaching "the use of $GaIn_{1-x}Sn_xO_3$ (wherein each x in the formula is independently a non-zero number) as a replacement for a layer of ITO." (Action, p. 3) (citation omitted). This is incorrect on several points. The Action appears to have substantially misapprehended the Phillips reference.

In pertinent part, Phillips teaches "$GaIn_{1-x}Sn_xO_3$, for $0 \leq x \leq 0.20$." (Phillips p. 115). Thus, Phillips is teaching a material which includes both $GaInSnO_3$ molecules and $GaInO_3$ molecules, the average over the entire material being represented by $GaIn_{1-x}Sn_xO_3$, where $0 \leq x \leq 0.20$. Indium is a constituent of each molecule.

Consequently, Phillips does not teach or suggest gallium-tin oxide as recited in claim 1. Rather, Phillips only teaches gallium-indium-tin oxide or gallium-indium oxide. Therefore, the combination of Hamada and Phillips fails to teach or suggest the claimed channel "wherein the one or more compounds of the formula $A_xB_xO_x$ includes one or more of gallium-germanium oxide, gallium-tin oxide, gallium-lead oxide, indium-germanium oxide, indium-lead oxide."

Additionally, Phillips does not, as alleged by the Office Action, teach or suggest "where each x is a non-zero number, but the value of "x" for each constituent element may be different," as recited in claim 1. While x may vary depending on the relative concentration of $GaInSnO_3$ molecules and $GaInO_3$ molecules in a sample of material, the x given in the formula $GaIn_{1-x}Sn_xO_3$ be the same for both instances of "x." (Phillips, p. 115).

Finally, Phillips does not reasonably teach or suggest replacing the ITO layer of Hamada as suggested by the Office Action. (Action, p. 4). Appellant notes that the ITO channel taught by Hamada is, and must be, a *semi conducting* material or the transistor is non-functional. In contrast, the Phillips reference relates to "transparent *conducting* thin films." (Phillips, title). As noted in the first paragraph of Phillips, "Indium tin oxide (ITO) has become the [transparent ***conducting*** oxide] TCO of choice for a wide variety of applications." (Phillips, p. 115).

Consequently, Phillips may be viewed as suggesting the replacement of an ITO layer with GIO, GGIO, or GITO, *within the context of using such layers as highly-conductive "transparent conducting" materials*. Nowhere, however, does Phillips suggest using GIO, GGIO, or GITO layers in applications where a high-resistance semi conductive material is desired, such as, for example, in the thin-film transistor channel layer described by Hamada.

Thus, it is unreasonable to suggest that one of skill in the art would consider Phillips, which references ITO as a transparent *conducting* material, as suggesting to one of skill in the art that a *semi conducting* ITO layer should be replaced with some other transparent *conducting* material that is equivalent to ITO in an entirely separate use and context.

Narushima fails to address or remedy any of these deficiencies. (Action, p. 4).

In response to these arguments, the final Office Action argues that "the limitations of claim 1 are open-ended, and the compounds ($A_xB_xO_x$) referred to therein can contain other elements (i.e, the gallium-tin oxide referred to in claim 1 can, within the scope of the claim, contain indium). It has been held that the use of the term 'comprising' leaves a claim open for inclusion of material or steps other than recited in the claims." (Action, p. 23).

Appellant agrees that the term "comprising" leaves a claim open for the inclusion of other elements not recited. However, the use of the term "comprising" does not mean that the Examiner can alter or disregard the elements specifically recited. Such is utterly unreasonable.

Claim 1 expressly recites "wherein the one or more compounds of the formula $A_xB_xO_x$ includes one or more of gallium-germanium oxide, gallium-tin oxide, gallium-lead oxide, indium-germanium oxide, indium-lead oxide." Anyone of any skill in the art will appreciate that the gallium-tin oxide recited in claim 1 is different from the gallium-indium-tin oxide taught by the cited prior art. Claim 1 does not recite gallium-indium-tin oxide, and the Examiner's attempt to read this subject matter into claim 1 so that the prior art can apply is entirely and obviously inappropriate. Again, the use of the term "comprising" does not license the Examiner to change or add to the chemical compounds specifically and expressly recited.

Under the analysis required by *Graham v. John Deere*, 383 U.S. 1 (1966) to support a rejection under § 103, the scope and content of the prior art must first be determined, followed by an assessment of the differences between the prior art and the claim at issue in view of the ordinary skill in the art. In the present case, the scope and content of the prior art, as evidenced by Hamada, Phillips and Narushima, did not include much of the claimed subject matter. Specifically, the claimed channel that "includes one or more of gallium-germanium oxide, gallium-tin oxide, gallium-lead oxide, indium-germanium oxide, indium-lead oxide" appears to be outside the scope and content of the prior art. The claimed channel with a material defined by the formula $A_xB_xO_x$, "where each x is a non-zero number, but the value of "x" for each constituent element may be different," is also outside the scope and content of the cited prior art. Moreover, the combination of Hamada and Phillips, as proposed in the Office Action, would not have been reasonable to one of ordinary skill in the art. Consequently, the cited prior art will not support a rejection of claim 1 under 35 U.S.C. § 103 and *Graham*.

Claim 18:

Claim 18 similarly recites:

> A semiconductor device, comprising:
> a drain electrode;
> a source electrode;
> *means for controlling current flow electrically coupled to the drain electrode and the source electrode, wherein the means for controlling current flow includes one or more compounds of the formula $A_xB_xO_x$ wherein the one or more compounds of the formula $A_xB_xO_x$ includes one or more of gallium-germanium oxide, gallium-tin oxide, gallium-lead oxide, indium-germanium oxide, indium-lead oxide, where each x is a non-zero number, but the value of "x" for each constituent element may be different*, wherein the channel includes one of an amorphous form and a mixed-phase crystalline form; and
> a gate electrode separated from a channel by a gate dielectric.

(Emphasis added).

For the same reasons given above, the combination of Hamada, Phillips and Narushima fails to reasonably teach or suggest the claimed device with "means for controlling current flow electrically coupled to the drain electrode and the source electrode, wherein the means for controlling current flow includes one or more compounds of the formula $A_xB_xO_x$, wherein the one or more compounds of the formula $A_xB_xO_x$ includes one or more of gallium-germanium oxide, gallium-tin oxide, gallium-lead oxide, indium-germanium oxide, indium-lead oxide, where each x is a non-zero number, but the value of "x" for each constituent element may be different." This subject matter has been shown to lie outside the scope and content of the cited prior art for the reasons given above. Therefore, the cited prior art will not support a rejection of claim 18 under 35 U.S.C. § 103 and *Graham*.

Claim 37:

Claim 37 recites:

> A semiconductor device formed by the steps, comprising:
> providing a drain electrode;
> providing a source electrode;
> providing a precursor composition including one or more precursor compounds that include A_x and one or more compounds that include B_x, wherein the one or more compounds of the formula $A_xB_xO_x$ includes one or more of gallium-germanium oxide, gallium-tin oxide, gallium-lead oxide, indium-germanium oxide, indium-lead oxide, where each x is a non-zero number, but the value of "x" for each constituent element may be different, wherein the channel includes one of an amorphous form and a mixed-phase crystalline form;
> depositing a channel including the precursor composition to form a multicomponent oxide from the precursor composition to electrically couple the drain electrode and the source electrode;
> providing a gate electrode; and
> providing a gate dielectric positioned between the gate electrode and the channel.

For the same reasons given above, the combination of Hamada, Phillips and Narushima fails to reasonably teach or suggest the claimed device "wherein the one or more

compounds of the formula $A_xB_xO_x$ includes one or more of gallium-germanium oxide, gallium-tin oxide, gallium-lead oxide, indium-germanium oxide, indium-lead oxide, where each x is a non-zero number, but the value of "x" for each constituent element may be different." This subject matter has been shown to lie outside the scope and content of the cited prior art for the reasons given above. Therefore, the cited prior art will not support a rejection of claim 37 under 35 U.S.C. § 103 and *Graham*.

(2) Claims 10-13 and 39:

This rejection should not be sustained for at least the same reasons given above in favor of the patentability of claims 1 and 37.

(3) Claims 14-17 and 40-41:

This rejection should not be sustained for at least the same reasons given above in favor of the patentability of claims 1 and 37.

(4) Claims 48-52:

Independent claim 48 recites:

> A display device, comprising:
> a plurality of pixel devices configured to operate collectively to display images, where each of the pixel devices includes a semiconductor device configured to control light emitted by the pixel device, the semiconductor device including:
> a drain electrode;
> a source electrode;
> a channel contacting the drain electrode and the source electrode, *wherein the channel includes one or more compounds of the formula $A_xB_xO_x$, wherein the one or more compounds of the formula $A_xB_xO_x$ includes one or more of gallium-germanium oxide, gallium-tin oxide, gallium-lead oxide, indium-germanium oxide, indium-lead oxide, each O is atomic oxygen, where each x is a non-zero number, but the value of "x" for each constituent element*

may be different, wherein the channel includes one of an amorphous form and a mixed-phase crystalline form;

a gate electrode; and

a gate dielectric positioned between the gate electrode and the channel and configured to permit application of an electric field to the channel.

(Emphasis added).

For the same reasons given above, the combination of Hamada, Phillips and Narushima fails to reasonably teach or suggest the claimed device including a transistor channel "wherein the one or more compounds of the formula $A_xB_xO_x$ includes one or more of gallium-germanium oxide, gallium-tin oxide, gallium-lead oxide, indium-germanium oxide, indium-lead oxide, each O is atomic oxygen, where each x is a non-zero number, but the value of "x" for each constituent element may be different." This subject matter has been shown to lie outside the scope and content of the cited prior art for the reasons given above.

Akimoto does not remedy the deficiencies of Hamada and Phillips explored above. Rather, Akimoto is merely cited for the context of transistors used in a display device with a plurality of pixel devices. Therefore, the cited prior art will not support a rejection of claim 48 under 35 U.S.C. § 103 and *Graham.*

(5) Claims 53 and 54;

This rejection should not be sustained for at least the same reasons given above in favor of the patentability of claim 48.

(6) Claims 55 and 56;

This rejection should not be sustained for at least the same reasons given above in favor of the patentability of claim 48.

In view of the foregoing, it is submitted that the final rejection of the pending claims is improper and should not be sustained. Therefore, a reversal of the Rejection of 11 April 2008 is respectfully requested.

Respectfully submitted,

DATE: August 1, 2008

Steven L. Nichols
Registration No. 40,326

Steven L. Nichols, Esq.
Managing Partner, Utah Office
Rader Fishman & Grauer PLLC
River Park Corporate Center One
10653 S. River Front Parkway, Suite 150
South Jordan, Utah 84095
(801) 572-8066
(801) 572-7666 (fax)

CERTIFICATE OF TRANSMISSION

I hereby certify that this correspondence is being transmitted to the Patent and Trademark Office facsimile number 571-273-8300 on August 1, 2008. Number of Pages: 34

Rebecca R. Schow

VIII. CLAIMS APPENDIX

1. (previously presented) A semiconductor device, comprising:

a drain electrode;

a source electrode;

a channel contacting the drain electrode and the source electrode, wherein the channel includes one or more compounds of the formula $A_xB_xO_x$, wherein the one or more compounds of the formula $A_xB_xO_x$ includes one or more of gallium-germanium oxide, gallium-tin oxide, gallium-lead oxide, indium-germanium oxide, indium-lead oxide, each O is atomic oxygen, where each x is a non-zero number, but the value of "x" for each constituent element may be different, wherein the channel includes one of an amorphous form and a mixed-phase crystalline form; and

a gate dielectric positioned between a gate electrode and the channel.

2. (Previously Presented) The semiconductor device of claim 1, wherein the one or more compounds of the formula $A_xB_xO_x$ includes an atomic composition of metal (A)-to-metal (B) ratio of A:B, wherein proportions of A, and B, based on stoichiometric x values associated with A, and B, are each in a range of about 0.05 to about 0.95.

3-5. (Cancelled)

6. (Previously Presented) The semiconductor device of claim 1, wherein the one or more compounds of the formula $A_xB_xO_x$ includes C_x, to form a compound of the formula $A_xB_xC_xO_x$, wherein each C is selected from the group of Ga, In, Ge, Sn, Pb, each O is atomic

oxygen, each x is independently a non-zero number, and wherein each of A, B, and C are different.

7. (Previously Presented) The semiconductor device of claim 6, wherein the one or more compounds of the formula $A_xB_xC_xO_x$ includes an atomic composition of metal (A)-to-metal (B)-to-metal (C) ratio of A:B:C, wherein proportions of A, B, and C, based on stoichiometric x values associated with A, B, and C, are each in a range of about 0.025 to about 0.95.

8. (previously presented) The semiconductor device of claim 6, wherein the one or more compounds of the formula $A_xB_xC_xO_x$ includes one or more of gallium-germanium-tin oxide, gallium-tin-lead oxide, gallium-germanium-lead oxide, gallium-indium-germanium oxide, gallium-indium-tin oxide, gallium-indium-lead oxide, indium-germanium-tin oxide, indium-tin-lead oxide, indium-germanium-lead oxide.

9. (Previously Presented) The semiconductor device of claim 8, wherein the one or more compounds of the formula $A_xB_xC_xO_x$ includes an atomic composition of metal (A)-to-metal (B)-to-metal (C) ratio A:B:C, wherein proportions of A, B, and C, based on stoichiometric x values associated with A, B, and C, are each in a range of about 0.025 to about 0.95.

10. (Previously Presented) The semiconductor device of claim 6, wherein the one or more compounds of formula $A_xB_xC_xO_x$ includes D_x, to form a compound of the formula $A_xB_xC_xD_xO_x$, wherein each D is selected from the group of Ga, In, Ge, Sn, Pb, each O is atomic oxygen, each x is independently a non-zero number, and wherein each of A, B, C, and D are different.

11. (Previously Presented) The semiconductor device of claim 10, wherein the one or more compounds of the formula $A_xB_xC_xD_xO_x$ includes an atomic composition of metal (A)-to-metal (B)-to-metal (C)-to-metal (D) ratio of A:B:C:D, wherein proportions of A, B, C, and D, based on stoichiometric x values associated with A, B, C, and D, are each in a range of about 0.017 to about 0.95.

12. (Previously Presented) The semiconductor device of claim 1, wherein the one or more compounds of the formula $A_xB_xC_xD_xO_x$ includes one or more of gallium-germanium-tin-lead oxide, gallium-indium-germanium-tin oxide, gallium-indium-germanium-lead oxide, gallium-indium-tin-lead oxide, indium-germanium-tin-lead oxide.

13. (Previously Presented) The semiconductor device of claim 12, wherein the one or more compounds of the formula $A_xB_xC_xD_xO_x$ includes an atomic composition of metal (A)-to-metal (B)-to-metal (C)-to-metal (D) ratio A:B:C:D, wherein proportions of A, B, C, and D, based on stoichiometric x values associated with A, B, C, and D, are each in a range of about 0.017 to about 0.95.

14. (Previously Presented) The semiconductor device of claim 10, wherein the one or more compounds of formula $A_xB_xC_xD_xO_x$ includes E_x, to form a compound of the formula $A_xB_xC_xD_xE_xO_x$, wherein each E is selected from the group of Ga, In, Ge, Sn, Pb, each O is atomic oxygen, each x is independently a non-zero number, and wherein each of A, B, C, D, and E are different.

15. (Previously Presented) The semiconductor device of claim 14, wherein the one or more compounds of the formula $A_xB_xC_xD_xE_xO_x$ includes an atomic composition of metal (A)-to-metal (B)-to-metal (C)-to-metal (D) ratio of A:B:C:D:E, wherein proportions of A, B, C, D, and E, based on stoichiometric x values associated with A, B, C, D and E, are each in a range of about 0.013 to about 0.95.

16. (Previously Presented) The semiconductor device of claim 1, wherein the one or more compounds of the formula $A_xB_xC_xD_xE_xO_x$ includes one or more of gallium-indium-germanium-tin-lead oxide.

17. (Previously Presented) The semiconductor device of claim 16, wherein the gallium-indium-germanium-tin-lead oxide includes an atomic composition of metal (A)-to-metal (B)-to-metal (C)-to-metal (D)-to-metal (E) ratio A:B:C:D:E, wherein proportions of A, B, C, D, and E, based on stoichiometric x values associated with A, B, C, D and E, are each in a range of about 0.013 to about 0.95.

18. (previously presented) A semiconductor device, comprising:

a drain electrode;

a source electrode;

means for controlling current flow electrically coupled to the drain electrode and the source electrode, wherein the means for controlling current flow includes one or more compounds of the formula $A_xB_xO_x$, wherein the one or more compounds of the formula $A_xB_xO_x$ includes one or more of gallium-germanium oxide, gallium-tin oxide, gallium-lead oxide, indium-germanium oxide, indium-lead oxide, where each x is a non-zero number, but

the value of "x" for each constituent element may be different, wherein the channel includes one of an amorphous form and a mixed-phase crystalline form; and

a gate electrode separated from a channel by a gate dielectric.

19. (Cancelled)

20. (Original) The semiconductor device of claim 18, wherein the source, drain, and gate electrodes include a substantially transparent material.

21-36. (Cancelled)

37. (previously presented) A semiconductor device formed by the steps, comprising:

providing a drain electrode;

providing a source electrode;

providing a precursor composition including one or more precursor compounds that include A_x and one or more compounds that include B_x, wherein the one or more compounds of the formula $A_xB_xO_x$ includes one or more of gallium-germanium oxide, gallium-tin oxide, gallium-lead oxide, indium-germanium oxide, indium-lead oxide, where each x is a non-zero number, but the value of "x" for each constituent element may be different, wherein the channel includes one of an amorphous form and a mixed-phase crystalline form;

depositing a channel including the precursor composition to form a multicomponent oxide from the precursor composition to electrically couple the drain electrode and the source electrode;

providing a gate electrode; and

providing a gate dielectric positioned between the gate electrode and the channel.

38. (Previously Presented) The semiconductor device of claim 37, wherein the one or more precursor compounds includes one or more precursor compounds that include C_x, wherein each C is selected from the group of Ga, In, Ge, Sn, Pb, each x is independently a non-zero number, and wherein each of A, B, and C are different.

39. (Previously Presented) The semiconductor device of claim 38, wherein the one or more precursor compounds includes one or more precursor compounds that include D_x, wherein each D is selected from the group of Ga, In, Ge, Sn, Pb, each x is independently a non-zero number, and wherein each of A, B, C, and D are different.

40. (Previously Presented) The semiconductor device of claim 39, wherein the one or more precursor compounds includes one or more precursor compounds that include E_x, wherein each E is selected from the group of Ga, In, Ge, Sn, Pb, each x is independently a non-zero number, and wherein each of A, B, C, D, and E are different.

41. (Original) The semiconductor device of claim 40, wherein depositing the channel includes vaporizing the precursor composition to form a vaporized precursor composition, and depositing the vaporized precursor composition using a physical vapor deposition technique including one or more of dc reactive sputtering, rf sputtering, magnetron sputtering, ion beam sputtering.

42. (Original) The semiconductor device of claim 37, wherein providing the source, the drain, and the gate electrodes includes providing a substantially transparent form of the source, the drain, and the gate electrodes.

43. (Original) The semiconductor device of claim 37, wherein providing the precursor composition includes providing a liquid form of the precursor composition.

44. (Original) The semiconductor device of claim 43, wherein depositing the channel includes an ink-jet deposition technique when the precursor composition includes the liquid form.

45-47. (Cancelled)

48. (previously presented) A display device, comprising:

a plurality of pixel devices configured to operate collectively to display images, where each of the pixel devices includes a semiconductor device configured to control light emitted by the pixel device, the semiconductor device including:

a drain electrode;

a source electrode;

a channel contacting the drain electrode and the source electrode, wherein the channel includes one or more compounds of the formula $A_xB_xO_x$, wherein the one or more compounds of the formula $A_xB_xO_x$ includes one or more of gallium-germanium oxide, gallium-tin oxide, gallium-lead oxide, indium-germanium oxide, indium-lead oxide, each O is atomic oxygen, where each x is a non-zero number, but the value of

"x" for each constituent element may be different, wherein the channel includes one of an amorphous form and a mixed-phase crystalline form;

a gate electrode; and

a gate dielectric positioned between the gate electrode and the channel and configured to permit application of an electric field to the channel.

49. (Original) The display of claim 48, wherein the source, the drain, and the gate electrodes include a substantially transparent material.

50. (Previously Presented) The display of claim 48, wherein the one or more compounds of the formula $A_xB_xO_x$ includes an atomic composition of metal (A)-to-metal (B) of ratio A:B, wherein proportions of A, and B, based on stoichiometric x values associated with A, and B, are each in a range of about 0.05 to about 0.95.

51. (Previously Presented) The display of claim 48, wherein the one or more compounds of the formula $A_xB_xO_x$ includes C_x, to form a compound of the formula $A_xB_xC_xO_x$, wherein each C is selected from the group of Ga, In, Ge, Sn, Pb, each O is atomic oxygen, each x is independently a non-zero number, and wherein each of A, B, and C are different.

52. (Previously Presented) The display of claim 51, wherein the one or more compounds of the formula $A_xB_xC_xO_x$ includes an atomic composition of metal (A)-to-metal (B)-to-metal (C) ratio A:B:C, wherein proportions of A, B, and C, based on stoichiometric x values associated with A, B, and C, are each in a range of about 0.025 to about 0.95.

53. (Previously Presented) The display of claim 51, wherein the one or more compounds of formula $A_xB_xC_xO_x$, includes D_x, to form a compound of the formula $A_xB_xC_xD_xO_x$, wherein each D is selected from the group of Ga, In, Ge, Sn, Pb, each O is atomic oxygen, each x is independently a non-zero number, and wherein each of A, B, C, and D are different.

54. (Previously Presented) The display of claim 53, wherein the one or more compounds of the formula $A_xB_xC_xD_xO_x$ includes an atomic composition of metal (A)-to-metal (B)-to-metal (C)-to-metal (D) ratio A:B:C:D, wherein proportions of A, B, C, and D, based on stoichiometric x values associated with A, B, C, and D, are each in a range of about 0.017 to about 0.95.

55. (Previously Presented) The display of claim 53, wherein the one or more compounds of formula $A_xB_xC_xD_xO_x$ includes E_x, to form a compound of the formula $A_xB_xC_xD_xE_xO_x$, wherein each E is selected from the group of Ga, In, Ge, Sn, Pb, each O is atomic oxygen, each x is independently a non-zero number, and wherein each of A, B, C, D, and E are different.

56. (Previously Presented) The display of claim 55, wherein the one or more compounds of the formula $A_xB_xC_xD_xE_xO_x$ includes an atomic composition of metal (A)-to-metal (B)-to-metal (C)-to-metal (D)to-metal (E) ratio A:B:C:D:E, wherein proportions of A, B, C, D, and E, based on stoichiometric x values associated with A, B, C, D, and E, are each in a range of about 0.013 to about 0.95.

57. (Cancelled)

RECEIVED
CENTRAL FAX CENTER
AUG 01 2008

IX. Evidence Appendix

None

X. Related Proceedings Appendix

None

XI. Certificate of Service

None